

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR022S Shuttle Environmental Microbiology
Sponsor:	Medical Operations
IPT:	Environmental Health
Category:	Medical Requirements (MR)
References:	Medical Operations Requirements Document for Space Shuttle, Rev G Section 4.1 Water Quality Section 4.3 Microbiology 4.3.1 Preflight Requirements 4.3.2 Postflight Microbiology Requirements
Purpose/Objectives:	To ensure a microbiologically safe environment for crewmembers aboard the Orbiter.
Measurement Parameters:	Microbial levels of Shuttle air, surface, water, and food
Deliverables:	<ul style="list-style-type: none"> ▪ Ground-based evaluation of Orbiter microbiological content by quantification and identification of bacteria and fungi ▪ Postflight evaluation of water samples and contingency samples from Orbiter. ▪ Final report of Shuttle microbiological environment
Flight Duration:	< 30 days
Number of Flights:	All Shuttle flights
Number and Type of Crew Members Required:	N/A – No crew time required
Other Flight Characteristics:	N/A

3.3 Preflight Training - None

3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	Preflight Microbial Sampling - No crew time required. Prior to occupancy of the Orbiter by crewmembers and/or flight support personnel, samples of the Orbiter are collected and tested for the quantitative presence of viable microorganisms. Microbial samples of the Orbiter air, selected surfaces, and potable water. JSC personnel select sample sites and the samples are collected with the help of KSC personnel. All sampling is done in accordance with the Microbial Operations Plan, JSC 11859. Samples are returned to JSC Microbiology Personnel who perform the analyses.			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		Orbiter air & surface sampling ≤2 hrs	L-15 to L-10 days	N/A	JSC Microbiology Personnel/ KSC Personnel
		Potable water microbial sampling ≤2 hrs	Post-service (after tanks are filled) L-15 days L-3 days	N/A	JSC Microbiology Personnel/ KSC Personnel
		Spacehab sampling to verify flight readiness ≤2 hrs	Before final closeout	N/A	JSC Microbiology Personnel/ KSC Personnel
		Flight Food Testing	L-6 months through launch	N/A	JSC Microbiology Personnel
Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:		Test Location:
	Microbiological Sample Collection Kit Microbial Air Sampler III		None		U.S.
Testing Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	8' x 10' with bench-top space	2 (volts AC)	Ambient	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Vibration/Acoustic Isolation:	Other:	
	Hot & cold for hand-washing	N/A	N/A	Refrigerator/freezer Cabinet & 4 drawers for storage of consumables.	
Constraints/Special Requirements:		<ul style="list-style-type: none">JSC Microbiology Personnel will specify sampling sites, determine acceptability limits, supervise sample collection and handling, assay protocols, testing, training and reporting.Water samples are collected and analyzed by KSC personnel; isolates are sent to JSC Microbiology Laboratory for organism identification.Representative packages of prepared in-flight food are analyzed by JSC Microbiology Laboratory and must pass testing before in-flight food is shipped to KSC.			

TABLE 3.4: PREFLIGHT ACTIVITIES (cont'd)

Launch Delay Requirements:	Sampling of Orbiter air & surface is repeated if launch delay is >48 hours from "last access" sampling.
Notes:	<ul style="list-style-type: none"> ▪ Inflight food packages are prepared at JSC. ▪ Adequate bench-top space should be available to perform microbiological procedures and sample packaging for shipment to JSC, when necessary. ▪ All microbial samples should be packed with cold packs and shipped via Federal Express or hand-carried on commercial airline to JSC within 24 hours of sampling.
Data Delivery	Data/Report to Designated Recipients:
	<ul style="list-style-type: none"> ▪ Air & surface sampling results that are outside acceptability limits are reported as soon as possible to personnel in the KSC Process Engineering Directorate, Mechanical systems Division, so that corrective actions may be initiated. Re-sampling is scheduled accordingly. A report is also sent to Flight Medicine. ▪ A final report is submitted within 21 days of landing to Shuttle Program Office, Flight Surgeon and others, as required.

3.5 In-Flight Activities - None

Postflight Activities

TABLE 3.6: POSTFLIGHT ACTIVITIES

Postflight Activity	Description:	Postflight Microbial Sampling - No crew time required. Nominally, postflight microbiological sampling of the Orbiter air and surfaces is not done. However, if the crew identifies problem areas while in-flight within the Orbiter, then samples will be collected as soon as possible postflight for evaluation of unacceptable contamination. Postflight potable water sampling is routinely done within 36 hours of landing. All sampling will be done in accordance with the Microbial Operations Plan, JSC 11859. JSC Microbiology Personnel will perform the analyses.				
	Schedule:	Duration:	Schedule:		Flexibility:	Personnel Required:
		Contingency sample collection of in-flight identified problem areas; duration depends upon sample sites	Earliest opportunity after landing		N/A	Collected by KSC Personnel/ Analyzed by JSC Microbiology Personnel
		Potable water microbial sampling ≤2 hrs	Within 36 hours of landing		N/A	Collected by KSC Personnel/ Isolates analyzed by JSC Microbiology Personnel
Ground Support Requirements Hardware/Software	Postflight Hardware:		Postflight Software:		Test Location:	
	Microbiological Sample Collection Kit Microbial Air Sampler III		N/A		U.S.	
Testing Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:		Temperature Requirements:		Special Lighting:
	8' x 10' with bench-top space	2 (volts AC)		Ambient		N/A
	Hot or Cold Running Water:	Privacy Requirements:		Vibration/Acoustic Isolation:		Other:
	Hot & cold for hand-washing	N/A		N/A		Refrigerator/freezer Cabinet & 4 drawers for storage of consumables.
Constraints/Special Requirements:	<ul style="list-style-type: none">▪ If missions exceed 7 days duration or if animal or plant test systems are flown, additional sampling may be required.▪ Water samples are collected and analyzed by KSC personnel; isolates are sent to JSC Microbiology Laboratory for organism identification					
Notes:	<ul style="list-style-type: none">▪ JSC Microbiology Laboratory personnel will determine specific sample locations in the Orbiter when necessary.▪ Adequate bench-top space should be available to perform microbiological procedures and sample packaging for shipment to JSC when necessary.▪ Contingency samples should be packed with cold packs and shipped via Federal Express or hand-carried on commercial airline to JSC within 24 hours of sampling.					
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):					
	<ul style="list-style-type: none">▪ Results that are outside acceptability limits are reported to Contamination Control at KSC.▪ A final report is submitted within 21 days of landing to Shuttle Program Office, Flight Surgeon and others, as required.					

3.6 Summary Schedule**TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	BLOOD VOLUME	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training: N/A						
Preflight						
Orbiter air & surface sampling	≤2 hrs	L-15 to L-10 days	N/A	N/A	JSC Microbiology Personnel/ KSC Personnel	-JSC Microbiology will specify sample locations
Spacehab sampling to verify flight readiness	≤2 hrs	Before final closeout	N/A	N/A	JSC Microbiology Personnel/ KSC Personnel	-JSC Microbiology will specify sample locations
Potable water microbial sampling	≤2 hrs	L-15 days L-3 days	N/A	N/A	JSC Microbiology Personnel/ KSC Personnel	Sampling done post-service (after tanks are filled)
Flight Food Testing	N/A	L-6 months through launch	N/A	N/A	JSC Microbiology Personnel	In-flight food packages must pass testing before they are shipped to KSC
In-Flight: N/A						
Postflight						
Contingency sample collection of in-flight identified problem areas	Dependent upon number of sample sites	Earliest opportunity after landing	N/A	N/A	Collected by KSC Personnel/ Analyzed by JSC Microbiology Personnel	If missions exceed 7 days duration or if animal or plant test systems are flown, additional sampling may be required.
Potable water microbial sampling	≤2 hrs	Within 36 hours of landing	N/A	N/A	Collected by KSC Personnel/ Isolates analyzed by JSC Microbiology Personnel	Water samples are collected and analyzed by KSC personnel; isolates are sent to JSC Microbiology Laboratory for organism identification
Postflight Debrief: N/A						